

**WHAT IS CLAIMED IS:**

1. A method of recording input packets on a storage medium comprising the steps of:
- 5 generating arrival time control clocks for the input packets; producing time stamps having values which indicate times of arrivals of the input packets and which are changed in synchronism with the arrival time control clocks to add the time stamps to the packets, respectively;
- 10 forming tracks on the storage medium in time sequence in response to reference control signals provided in synchronism with said arrival time control clocks; and recording the packets to which the time stamps are added on the storage medium in order of arrivals of the packets so that each
- 15 of the packets is recorded within a given area ranging from a reference position defined on one of the tracks corresponding to an arrival time of each of the packets to a given position away from the reference position at a preselected distance toward the following track.
- 20
2. A method of recording input packets on a storage medium as set forth in claim 1, wherein said recording step expands the packets in time to record them on the storage medium.
- 25 3. A method of recording input packets on a storage medium comprising the steps of:

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generating arrival time control clocks for the input packets;  
producing time stamps having values which indicate times of arrivals of the input packets and which are changed in synchronism with the arrival time control clocks to add the time stamps to the packets, respectively;

forming tracks on the storage medium in sequence in

recording the packets to which the time stamps are added on the storage medium in order of arrivals of the packets so that each of the packets is recorded within a given area ranging from a first position to a second position across a reference position, the reference position being defined on one of the tracks corresponding to an arrival time of each of the packets, the first and second positions being defined away from the reference position at preselected distances toward the tracks preceding and following the one of the tracks, respectively.

generating arrival time control clocks in synchronism with changes in value of time stamps for arrival time identification added to the input packets;

forming tracks on the storage medium in sequence in response to reference control signals provided in synchronism with said arrival time control clocks; and

recording the packets with the time stamps on the storage medium in order of arrivals of the packets so that each of the packets is recorded within a given area ranging from a first position to a second position across a reference position, the reference position being defined on one of the tracks corresponding to an arrival time of each of the packets, the first and second positions

being defined away from the reference position at preselected distances toward the tracks preceding and following the one of the tracks, respectively.

- 5 7. A method of recording input packets on a storage medium comprising the steps of:

generating arrival time control clocks for the input packets;  
producing time stamps having values which indicate times of arrivals of the input packets and which are changed in synchronism  
10 with the arrival time control clocks to add the time stamps to the packets, respectively;

forming tracks on the storage medium in time sequence in response to reference control signals provided in synchronism with said arrival time control clocks; and

- 15 recording the packets to which the time stamps are added on the storage medium in order of arrivals of the packets so as to shift toward a first one of the packets at least one of the packets following the first one of the packets within a given area ranging from a reference position defined on one of the tracks  
20 corresponding to an arrival time of the first one of the packets to a given position away from the reference position at a preselected distance toward the following tracks.

8. A method of recording input packets on a storage medium  
25 comprising the steps of:

generating arrival time control clocks in synchronism with

changes in value of time stamps for arrival time identification added to the input packets;

forming tracks on the storage medium in sequence in response to reference control signals provided in synchronism with  
5 said arrival time control clocks; and

recording the packets to which the time stamps are added on the storage medium in order of arrivals of the packets so as to shift toward a first one of the packets at least one of the packets following the first one of the packets within a given area ranging  
10 from a reference position defined on one of the tracks corresponding to an arrival time of the first one of the packets to a given position away from the reference position at a preselected distance toward the following tracks.

15 9. A method of recording input packets on a storage medium comprising the steps of:

generating reference control signals in asynchronism with changes in value of time stamps for arrival time identification added to the packets;

20 forming tracks on the storage medium in time sequence in response to said reference control signals; and

recording the packets to which the time stamps are added on the storage medium in order of arrivals of the packets so that each of the packets is recorded within a given area ranging from a first  
25 position corresponding to an arrival time of each of the packets to a second position away from the first position at a preselected

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distance toward the following tracks.

10. A method of recording input packets on a storage medium as set forth in claim 9, further comprising a step of adding time  
5 stamps to the input packets in place of the time stamps already added to the input packets prior to performing said reference control signal generating step.

11. A method of recording input packets on a storage medium  
10 comprising the steps of:

generating reference control signals in asynchronism with changes in value of time stamps for arrival time identification added to the packets;

forming tracks on the storage medium in time sequence in  
15 response to said reference control signals; and

recording the packets to which the time stamps are added on the storage medium in order of arrivals of the packets so that each of the packets is recorded within a given area ranging from a reference position defined on one of the tracks to a given position  
20 away from the reference position at a preselected distance toward the following tracks.

12. A method of recording input packets on a storage medium as set forth in claim 11, further comprising a step of adding time  
25 stamps to the input packets in place of the time stamps already added to the input packets prior to performing said reference

control signal generating step.

A method of recording input packets comprising the steps of:

- generating reference control signals in value of time stamps for arriving packets;
- forming tracks on the storage medium in response to said reference control signals;
- recording the packets to which the time stamps are related on the storage medium in order of arrivals;
- the time stamps of each packet is recorded within a given distance from a reference position to a second position across a range of distances, the reference position being defined on one side of the storage medium and the arrival time of each of the packets being defined away from the reference position by selected distances toward the tracks;
- one of the tracks, respectively.

generating reference control signals in asynchronism with changes in value of time stamps for arrival time identification added to the packets;

10 recording the packets to which the time stamps are added on  
the storage medium in order of arrivals of the packets so that each  
of the packets is recorded within a given area ranging from a first  
position to a second position across a reference position, the  
reference position being defined on one of the tracks corresponding  
15 to an arrival time of each of the packets, the first and second  
positions being defined away from the reference position at  
preselected distances toward the tracks preceding and following  
the one of the tracks, respectively.

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generating output time control clocks which correspond to

25 positions of the tracks formed on the storage medium and which  
undergo delays of preselected time corresponding to a given area on

the tracks formed in time sequence on the storage medium; and  
outputting the packets with timing determined by the time  
stamps on a basis of the output time control clocks.

5 15. A method as set forth in claim 14, wherein each of the delays  
of preselected time corresponds to a time interval of one track.

16. A method of reproducing packets with time stamps for arrival  
time identification recorded on tracks formed in time sequence on  
10 a storage medium comprising the steps of:

reproducing the packets and the time stamps from the  
storage medium;

generating output time control clocks whose initial value is  
determined by one of the time stamps; and

15 outputting the packets at time intervals determined by the  
time stamps on a basis of the output time control clocks.

17. A packet recording apparatus for recording packets on tracks  
formed in time sequence on a storage medium comprising:

20 clock generating means for generating arrival time control  
clocks;

time stamp producing means for producing time stamps in  
synchronism with said arrival time control clocks for identifying  
arrival times of the packets to add the time stamps to the packets,

25 respectively; and

recording means for recording the packets to which said time

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stamps are added on the storage medium in order of arrivals of the packets so that each of the packets is recorded within a given area ranging from a reference position defined on one of the tracks corresponding to an arrival time of each of the tracks to a given  
5 position away from the reference position at a preselected distance toward the following track.

18. A packet recording apparatus as set forth in claim 17, wherein said reference position is a record-starting position defined on the  
10 one of the tracks.

19. A packet recording apparatus for recording packets on tracks formed in time sequence on a storage medium comprising:

clock generating means for generating arrival time control  
15 clocks;

time stamp producing means for producing time stamps in synchronism with said arrival time control clocks for identifying arrival times of the packets to add the time stamps to the packets, respectively; and

20 recording means for recording the packets to which said time stamps are added on the storage medium in order of arrivals of the packets so that each of the packets is recorded within a given area ranging from a first position to a second position across a reference position, the reference position being defined on one of the tracks  
25 corresponding to an arrival time of each of the packets, the first and second positions being defined away from the reference position at

preselected distances toward the tracks preceding and following the one of the tracks, respectively.

20. A packet recording apparatus for recording input packets on a  
5 storage medium comprising:

clock generating means for generating arrival time control clocks which are synchronous with values of time stamps added to the input packets;

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10 recording means for recording tracks on the storage medium in time sequence to record the packets to which said time stamps are added on the storage medium in order of arrivals of the packets so that each of the packets is recorded within a given area ranging from a reference position defined on one of the tracks corresponding to an arrival time of each of the packets to a given  
15 position away from the reference position at a preselected distance toward the following track; and

controlling means for controlling positions of the tracks formed on the storage medium in synchronism with said arrival time control clocks.

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21. A packet recording apparatus as set forth in claim 20, wherein said reference position is a record-starting position defined on the one of the tracks.

25 22. A packet recording apparatus for recording input packets on a storage medium comprising:

clock generating means for generating arrival time control clocks which are synchronous with values of time stamps added to the input packets;

5 recording means for recording tracks on the storage medium in time sequence to record the packets to which the time stamps are added on the storage medium in order of arrivals of the packets so that each of the packets is recorded within a given area ranging from a first position to a second position across a reference position, the reference position being defined on one of the tracks  
10 corresponding to an arrival time of each of the packets, the first and second positions being defined away from the reference position at preselected distances toward the tracks preceding and following the one of the tracks, respectively; and

controlling means for controlling positions of the tracks  
15 formed on the storage medium in synchronism with said arrival time control clocks.

23. A packet reproducing apparatus comprising:

reproducing means for reproducing tracks formed in time  
20 sequence on a storage medium to reproduce packets, to which time stamps for arrival time identification are added, recorded on the tracks;

clock generating means for generating clocks having a given frequency;

25 track control means for controlling positions where the tracks are reproduced by said reproducing means in synchronism with said

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5       comparing means comparing a value changed in synchronism  
with said output control clocks with one of the time stamps to  
provide a signal when said value coincides with said one of the time  
stamps; and

24. A packet reproducing apparatus as set forth in claim 23,  
further comprising time stamp removing means for removing the  
time stamp from said one of the packets outputted from said  
15 outputting means.

clock generating means for generating arrival time control

clocks;

first speed control means for controlling the speed of the rotary drum so as to synchronize with the arrival time control clocks every six of tracks;

5 time stamp producing means for producing time stamps in synchronism with said arrival time control clocks to add the time stamps to the packets to be recorded on the first magnetic tape, respectively;

record controlling means for controlling said recording means  
10 so that each of the packets is recorded within a one-track area, a two-track area, or a one-track over area, the one-track area ranging from a reference position defined on one of the tracks corresponding to an arrival time of each of the tracks to a given position away from the reference position at a given interval toward  
15 the following track, the two-track area ranging from a first position to a second position which are defined away from the reference position at preselected distances toward the tracks preceding and following said one of the tracks, respectively, the one-track over  
20 area ranging from a record-starting position on said one of the tracks to a predetermined position away from the record-starting position at a preselected interval toward the following tracks;

clock generating means for generating clocks having a given frequency;

second speed control means for controlling the speeds of the  
25 rotary drum and the second magnetic tape at six-track intervals based on signals reproduced from the second magnetic tape and

said clocks generated by said clock generating means;

output control clock generating means for generating output control clocks after a delay of given time from said clocks generated by said clock generating means, respectively;

5        comparing means comparing a value changed in synchronism with said output control clocks with one of the time stamps reproduced from the second magnetic tape to provide a signal when said value coincides with said one of the time stamps;

10        outputting means for outputting one of the packets to which said one of the time stamp is added; and

time stamp removing means for removing the time stamp from said one of the packets outputted from said outputting means.

26.    A packet recording/reproducing apparatus comprising:

15        recording means for recording tracks, in time sequence, on a first magnetic tape helically wrapped about a given area of a rotary drum using rotary heads disposed in the rotary drum to record input packets on the tracks in order of arrival of the input packets;

20        reproducing means for reproducing tracks formed in time sequence on a second magnetic tape to reproduce packets recorded on the tracks of the second magnetic tape through the rotary heads of the rotary drum;

25        clock generating means for generating arrival time control clocks which are synchronous with values of time stamps added to the packets to be recorded on the first magnetic tape;

first speed control means for controlling the speed of the

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rotary drum so as to synchronize with the arrival time control clocks every six of tracks;

record controlling means for controlling said recording means so that each of the packets is recorded within a one-track area, a  
5 two-track area, or a one-track over area, the one-track area ranging from a reference position defined on one of the tracks corresponding to an arrival time of each of the packets to a given position away from the reference position at a given interval toward the following track, the two-track area ranging from a first position  
10 to a second position which are defined away from the reference position at preselected distances toward the tracks preceding and following said one of the tracks, respectively, the one-track over area ranging from a record-starting position on said one of the tracks to a predetermined position away from the record-starting  
15 position at a preselected interval toward the following tracks;

clock generating means for generating clocks having a given frequency;

second speed control means for controlling the speeds of the rotary drum and the second magnetic tape at six-track intervals  
20 based on signals reproduced from the second magnetic tape and said clocks generated by said clock generating means;

output control clock generating means for generating output control clocks after a delay of given time from said clocks generated by said clock generating means, respectively;

25 comparing means comparing a value changed in synchronism with said output control clocks with one of the time stamps

reproduced from the second magnetic tape to provide a signal when said value coincides with said one of the time stamps; and

outputting means for outputting one of the packets to which said one of the time stamp is added.

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27. In a storage medium on which tracks are formed in time sequence in synchronism with changes in value of time stamps for packet arrival time identification added to packets recorded on the storage medium, each of the packets being recorded within a one-track area, a two-track area, or a one-track over area, the one-track area ranging from a reference position defined on one of the tracks corresponding to an arrival time of each of the packets to a given position away from the reference position at a given interval toward the following track, the two-track area ranging from a first position to a second position which are defined away from the reference position at preselected distances toward the tracks preceding and following said one of the tracks, respectively, the one-track over area ranging from a record-starting position on said one of the tracks to a predetermined position away from the record-starting position toward the following tracks at a preselected interval which is greater than a width of each of the tracks.

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28. A digital broadcasting receiver comprising:

demodulating means for demodulating digital broadcasting signals including packets of information on a plurality of programs and time control packets each including time control information

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5 identification information producing means for producing  
identification information serving to identify the time control  
packet from the packets selected by said selecting means, said  
identification information producing means outputting the  
identification information along with the packets selected by said  
10 selecting means; and

15 29. A digital broadcasting receiver as set forth in claim 28, wherein said identification information is formed with a time control information identification flag which is added by said identification information producing means to a header of the time control packet.

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31. A digital broadcasting receiver as set forth in claim 30,

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wherein when said selecting means selects the packets of two or more of the programs and when the packet identifying numbers of the time control packets of the two or more selected programs are different from each other, said identification information producing  
5 means produces the identification information serving to identify the time control packet specified by given one of the packet identifying numbers.

32. A digital broadcasting receiver as set forth in claim 29,  
10 wherein the digital signals are formed with transport packets having program specific information of MPEG2, and wherein said time control information is provided by a program clock reference.

33. A packet recording apparatus for recording input digital  
15 signals multiplexing packets of information on at least one program, a time control packet including time control information on the program, and identification information serving to identify the time control packet, comprising:

extracting means for extracting the time control information  
20 from the digital signals based on the identification information;

clock generating means for generating clocks which are synchronous with input of the time control information extracted by said extracting means;

reference control signal generating means for generating  
25 reference control signals in synchronism with the clocks generated by said clock generating means; and

recording means for recording said digital signals on a storage medium in response to the reference control signals generated by said reference control signal generating means.

5 34. A packet recording apparatus as set forth in claim 33, wherein said recording means forms tracks on the storage medium in sequence based on the reference control signals for recording thereon the digital signals.

10 35. A packet recording apparatus as set forth in claim 33, wherein said identification information is formed with a time control information identification flag which is added to a header of the time control packet.

15 36. A packet recording apparatus as set forth in claim 33, wherein said identification information includes a packet identifying number for identifying the time control packet.

20 37. A packet recording apparatus as set forth in claim 33, wherein the digital signals are formed with transport packets of MPEG2, and wherein said time control information is provided by a program clock reference.

25 38. A packet recording apparatus comprising:  
arrival time control clock generating means for generating arrival time control clocks in synchronism with input of a time

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reference value added to input packets;

arrival time identification reference value generating means  
for generating arrival time identification reference values in  
synchronism with the arrival time control clocks generated by said  
5 arrival time control clock generating means;

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synchronization determining means for determining whether  
the arrival time control clocks are synchronous with the input of the  
time reference value or not, said synchronization determining  
means providing a first signal when the arrival time control clocks  
10 are synchronous with the input of the time reference value and a  
second signal when the arrival time control clocks are asynchronous  
with the input of the time reference value;

adding means for adding the arrival time identification  
reference values to the input packets;

15 switching means for switching between a first operation and a  
second operation, the first operation being provided in response to  
the first signal from said synchronization determining means to  
allow operations of said arrival time control clock generating means  
and said adding means, the second operation being provided in  
20 response to the second signal from said synchronization  
determining means to inhibit the operation of said arrival time  
control clock generating means; and

recording means for recording the packets to which the  
arrival time identification reference values are added by said adding  
25 means on a storage medium.

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40. A packet recording apparatus comprising:  
 arrival time control clock generating means for generating  
 20 arrival time control clocks in synchronism with input of a time  
 reference value added to input packets;  
 arrival time identification reference value generating means  
 for generating arrival time identification reference values in  
 synchronism with the arrival time control clocks generated by said  
 25 arrival time control clock generating means;  
 lock flag producing means for producing a lock flag indicative

of a synchronization condition of said arrival time control clock generating means a preselected period of time after a first one of the packets is inputted to said arrival time control clock generating means;

5 adding means for adding the lock flag along with the arrival time identification reference values to the input packets; and

recording means for recording the packets to which the arrival time identification reference values are added by said adding means on a storage medium.

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41. A packet recording apparatus comprising:

arrival time control clock generating means for generating arrival time control clocks in synchronism with input of a time reference value added to input packets;

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arrival time identification reference value generating means for generating arrival time identification reference values in synchronism with the arrival time control clocks generated by said arrival time control clock generating means;

20 synchronization determining means for determining whether the arrival time control clocks are synchronous with the input of the time reference value or not, said synchronization determining means providing a first signal when the arrival time control clocks are synchronous with the input of the time reference value and a second signal when the arrival time control clocks are asynchronous with the input of the time reference value;

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adding means for adding the arrival time identification

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controlling means for controlling an operation of said  
recording means, said controlling means supplying the packets to  
said adding means at all times, activating the operation of said  
recording means in response to the first signal from said  
synchronization determining means, and deactivating the operation  
of said recording means in response to the second signal from said  
synchronization determining means.

42. A packet recording apparatus as set forth in claim 38, wherein  
said packets are transmitted by digital signals carrying one or more  
15 programs and said time reference value added to one of said  
packets.

43. A packet recording apparatus as set forth in claim 40, wherein  
said packets are transmitted by digital signals carrying one or more  
20 programs and said time reference value added to one of said  
packets.

44. A packet recording apparatus as set forth in claim 41, wherein  
said packets are transmitted by digital signals carrying one or more  
25 programs and said time reference value added to one of said  
packets.